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(54) CABLE BRANCH CONNECTION SLEEVE

(71) I, ALOIS SCHIFFMAN, a German Citizen, of 15 Streitfeldstrasse, D-8 Munich 8, Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a cable sleeve for use in connecting a multicore main power cable to a multicore branch power cable.

The connection of a main cable to a branch cable can usually be effected in such a manner that, after removing the outer enclosure of the main cable, terminals are applied to the conductors of the cable, which terminals are provided with devices for contacting the conductors without prior stripping of the insulation. A respective conductor of the branch cable is then connected to each terminal. The terminals can also be combined into a ring. Subsequently, the cable joint with the terminals is inserted into a cable sleeve, and this latter is closed and, if need be, also compound-filled. The formation of such a connection is costly, on account of the steps of making the contacts and inserting the same into the sleeve. Also, there is a minimum size of cable sleeve which can be used, since the stripped part of the main cable and the terminals have to be accommodated in the sleeve. Because of the steps above-discussed and the size of the sleeve, assembly under restricted space conditions, such as in a cable trench, is difficult

An object of the invention is to obviate the above-discussed disadvantages and to provide a cable sleeve which makes possible quicker and simpler assembly of the connection of the main cable to the branch cable, which is smaller than former cable sleeves, and which facilitates assembly under unfavourable space conditions, or requires a smaller trench.

The present invention provides a branch connection between a multi-cored main cable and a multi-cored branch cable comprising a cable sleeve through which the main cable runs and into which the branch cable enters, the cable sleeve being of the kind comprising a body part and a lid part which can be closed together to form a sealed enclosure for the cables in the region of the branch, wherein the sleeve accommodates contacting devices internally, the contact devices being of the kind which can penetrate the insulation of the conductors of the main cable to establish electrical connection with the conductors without prior stripping the insulation of the conduction and the contact devices provide means to accept the termination of the conductors of the branch cable, the cable sleeve parts and the contacting devices being arranged so that upon or after closure together of the sleeve parts and with the conductor of the branch cable terminated in the contactor devices, said devices can be caused to penetrate the insulation of the main cable conduction to set up said branch connection.

With such a construction, the need for separate terminals for contacting the conductors is obviated; on the contrary, the contacting of the conductors and the sheathing of a branch connection is effected by means of one and the same device, namely the cable sleeve provided with the contacting devices. With a suitable defined arrangement of the contact devices, the latter are also prevented from being mounted in the wrong places inside the sleeve, upon assembly, and from making contact with the sleeve or with each other. Removal of the outer enclosure and disturbance of the wrapping wires of the main cable is necessary only in the immediate vicinity of the contacting points, whereby a shorter design of the cable sleeve is achieved, as compared with prior known proposals.

The devices for contacting the conductors without prior stripping of the insulation may be milling screws, extending through the housing, and adapted to provide rotating cutting edges to bite into the conductor insulation, or may be non-rotating cutting edges adapted for penetrating the conductor insulation. Such non-rotating cutting edges can be located so as to act radially inwards of the main cable or they may be like wedges for

insertion between the conductors of the main cable to act radially outwards of that cable.

If the arrangement is such that contacting of the conductors is not achieved upon the closing together of the sleeve parts, but is adapted to be effected after closing of the sleeve parts, then the contacting device must be operable to act on the main cable by access through the sleeve. This an be achieved, for example, by making the milling screws accessible through the sleeve or by using one or more pressure screws extending through the sleeve to press the conductors of the main cable and the cutting edges together. The pressure screws advantageously have a thrust piece, formed with a cutting edge, situated in front thereof. Sealing plugs can be provided to close access points through the cover.

Where contacting is achieved by means of cutting edges on wedges pushed between the conductors, further cutting edges, insulated from one another, can additionally be provided which further cutting edges penetrate the conductor insulation, but only for the purpose of mechanical location or gripping of the conductors within the cable sleeve.

In the case where contacting of the conductors is achieved after closing together the sleeve parts by means of milling screws or cutting edges situated inside the sleeve, wedges can be pushed between the conductors, which wedges are provided with cutting edges made of insulating material, which again penetrate the core insulation, but only for location and gripping reasons.

Advantageously, springs are provided to assist in the maintenance of electrical connection established between the contacting devices and the main cable.

The branch cable can be connected firmly on the sleeve as a specific desired length, the conductors of the branch cable already being connected to the contacting devices. This leads to a further simplification of the assembly, since the branch conductors do not have to be connected in at the place of assembly. By having the branch cable already connected to the cable sleeve parts it is also possible to achieve a reduction in the sleeve dimensions. With a firmly connected branch cable, just as in the case where contacting is achieved during closing of the sleeve, the efficiency of the contacting is not dependent upon the operator, and consequently, at least in these respects, satisfactory contact conditions are at all times guaranteed.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a cross-section through a first embodiment of cable sleeve according to the invention, this embodiment having contacting devices in the form of milling screws providing rotating cutting edges:

Fig. 2 is a longitudinal section through the cable sleeve of Fig. 1:

Fig. 3 is a cross-section through a second embodiment of cable sleeve according to the invention, this embodiment having contacting devices in the form of non-rotating cutting edges:

Fig. 4 is a longitudinal section through the cable sleeve of Fig. 3:

Fig. 5 is a cross-section through a third embodiment of cable sleeve according to the invention, this embodiment having contacting devices in the form of cutting edges on wedges:

Fig. 6 is a longitudinal section through the cable sleeve of Fig. 5:

Fig. 7 is a cross-section through a fourth embodiment of cable sleeve according to the invention, this embodiment providing contacting to be achieved upon the closing of the sleeve parts: and

Fig. 8 is a longitudinal section of the cable sleeve of Fig. 7.

The cable sleeve of Figs. 1 and 2 comprises a lower or body part 1 and a lid part 2 which are connected to each other by screws 3 and 4. Extending through the cable sleeve is a main power cable comprising conductors 5,6 and 7 which are surrounded by their respective insulations 8, 9 and 10. A milling screw 11 extends through the lid 2, and milling screws 12 and 13 extend through the lower part 1 of the sleeve. After the cable sleeve is closed, these milling screws 11, 12 and 13 are screwed into the respective conductors, and bite through the insulations 8, 9, 10 by way of their respective rotating cutters 14, 15 and 16 provided on the front ends thereof. The milling screws 11, 12 and 13 are accommodated in and guided in respective contact pieces 17, 18 and 19 into which respective conductors 20, 21 and 22 of a branch cable 23 are fixed. The contact pieces 17, 18, 19, and the milling screws 11, 12 13, form contacting devices and are subject to the pressure of respective springs 24, 25 and 26. Respective guide holes, through the sleeve, for the milling screws 11, 12, 13 are sealed by respective screw plugs 27, 28 and 29 after the milling screws 11, 12, 13 have been tightened. To maintain the spacing thereof, wedges 30, 31 and 32, made of insulating material, lie between the conductors 5, 6 and 7. Wrapping wires of the main cable are, in addition, taken through the cable sleeve, as bunched-up strings 34, 35, and are connected by means of terminal 36 to a similarly bunched string 35 of the wrapping wires of the branch cable 23.

In the embodiment of Figs. 3 and 4, non-rotating cutting edges 43 and 44 are provided in the lower part 41 of the cable sleeve, and in lid 42 cutting edges 45 are

connected, via a pressure piece 46 and spring rings 47', to a pressure screw 47. The cutting edges 45, the pressure piece 46 and the screw 47 are guided in a port 48 in the lid 42 of the cable sleeve. Provided on the contact pieces carrying the cutting edges 43, 44 and 45 are recesses 43', 44' and 45', which receive conductors 49, 50 and 51 of a branch cable 52. Lying between conductors 53, 54 and 55 of a main cable are insulating wedges 56, 57 and 58. Designated by the numeral 59 is a bunched string of combined wires formed from the wrapping of the main cable.

After removal of the outer enclosure of the main cable and disturbance of the wrapping wires in the region of the cable joint, the insulating wedges 56, 57, 58 are pushed in between the conductors 53, 54, 55, the main cable is inserted into the cable sleeve, and the latter is closed. Thereupon, the cutting edges 45 are pressed, by means of the pressure screw 47, onto the conductor 53, and pierce the insulation thereof, so that they make contact with the conductor 53 and consequently the connection to the conductor 51 of the branch cable is established. The reaction to the pressure created by the screw 47 leads to the fact that the cutting edges 43 and 44 are forced through the insulations of the respective conductors 54 and 55 and make contact with the latter, so that at the same time the connections to the conductor 49 and 50 of the branch cable are established.

In the embodiment of Figs. 5 and 6, inserted between conductors 61, 62 and 63 of the main cable are wedges 64, 65 and 66, which are each provided on the one side with respective metallic cutting edges 67, 68 and 69 which penetrate the insulations of conductors 61, 62 and 63 and make contact with the latter. The metallic cutting edges 67, 68 and 69 are contiguous with eyes 70, 71 and 72, into which the branch conductors 73, 74 and 75 are fixed. On their opposed sides, the wedges 64, 65, 66 are provided with respective cutting edges 76, 77, 78, made of insulating material, which, for the purpose of achieving a good mechanical grip, penetrate into the insulations of the respective conductors. Provided in the lower part of the sleeve housing 79 are insulated cutting edges 80 and 81 which assist with gripping. Slidably guided in the lid 82 of the sleeve is a pressure screw 83 having insulated cutting edges 84 also to assist with gripping. Upon the tightening of the screw 83, after closing of the sleeve, all the cutting edges penetrate into the insulations of the respective conductors, whereby the cutting edges 67, 68 and 69 make contact with the conductors 61, 62 and 63.

A bunched string 85 of combined wires of the sheathing of the main cable is connected via a terminal 86 to neutral conductor 87 of the branch cable.

In the embodiment of Figs. 7 and 8, contacting of conductors 91, 92 and 93 of the main cable is achieved by means of screws 96 and 97 during tightening of lid 94 of the sleeve onto lower part 95 thereof. Provided in the lower part 95 of the sleeve, for this purpose, are cutting edges 98 and 99 which contact the conductors 91 and 93, whilst situated in the sleeve lid 94 are the cutting edges 100 which make contact with the conductor 92. The cutting edges are insulated relative to the sleeve by insulations 101, 102 and 103, when the sleeve parts are of metal. If, however, the sleeve is made of a plastics material, these insulations are unnecessary. The cutting edges 98, 99 and 100 project from contact pieces 104, 105 and 106 in which conductors 107, 108 and 109 of the branch cable are fixed. Lying between the conductors 91, 92 and 93 are insulation wedges 110, 111 and 112. Combined in a terminal 113 situated on the sleeve are a bunched string 114 of sheathing wires of the main cable and the neutral conductor 115 of the branch cable. A further bunched string 116 of wires of the sheathing of the main cable runs through the sleeve.

The invention is not confined to the precise details of the foregoing examples and variations may be made thereto. Thus, it will be appreciated that the terminal constructions of each of the embodiments may be incorporated in those of the other embodiments.

WHAT I CLAIM IS:—

1. A branch connection between a multi-cored main cable and a multi-cored branch cable comprising a cable sleeve through which the main cable runs and into which the branch cable enters, the cable sleeve being of the kind comprising a body part and a lid part which can be closed together to form a sealed enclosure for the cables in the region of the branch, wherein the sleeve accommodates contacting devices internally, the contact devices being of the kind which can penetrate the insulation of the conductors of the main cable to establish electrical connection with the conductors without prior stripping the insulation of the conductors and the contact devices provide means to accept the termination of the conductors of the branch cable, the cable sleeve parts and the contacting devices being arranged so that upon or after closure together of the sleeve parts and with the conductor of the branch cable terminated in the contact devices, said devices can be caused to penetrate the insulation of the main cable conductors to set up said branch connection.

2. A cable sleeve as claimed in claim 1 wherein electrical connection is established after closure together of the sleeve parts and said contacting devices to penetrate the

insulation of the main cable are milling screws providing rotating cutting edges.

3. A cable sleeve as claimed in claim 1 wherein said contacting devices have non-rotating cutting edges to penetrate the insulation of the main cable.

4. A cable sleeve as claimed in claim 3 wherein the cutting edges are located to act radially inward of the main cable.

5. A cable sleeve as claimed in claim 3 wherein the cutting edges are provided on wedges for insertion between the conductors of the main cable to act radially outward of the main cable.

6. A cable sleeve as claimed in claims 3, 4 or 5 wherein the cutting edges are caused to penetrate the insulation of the main cable by a pressure screw extending through the sleeve.

7. A cable sleeve as claimed in claims 3, 4 5, or 6 having additionally non-rotating cutting edges of insulating material to penetrate the insulation of the main cable to provide mechanical location or gripping of the conductors of that cable in the sleeve.

8. A cable sleeve as claimed in claim 1 having spring means to assist in the maintenance of electrical connection established between the contacting devices and the main cable.

9. A cable sleeve as claimed in any preceding claim wherein the sleeve is filled with a sealing or insulating compound.

10. A cable sleeve substantially as hereinbefore described with reference to and as illustrated in Figs 1 and 2, in Figs. 3 and 4, in Figs. 5 and 6, or in Figs. 7 and 8 of the accompanying drawings.

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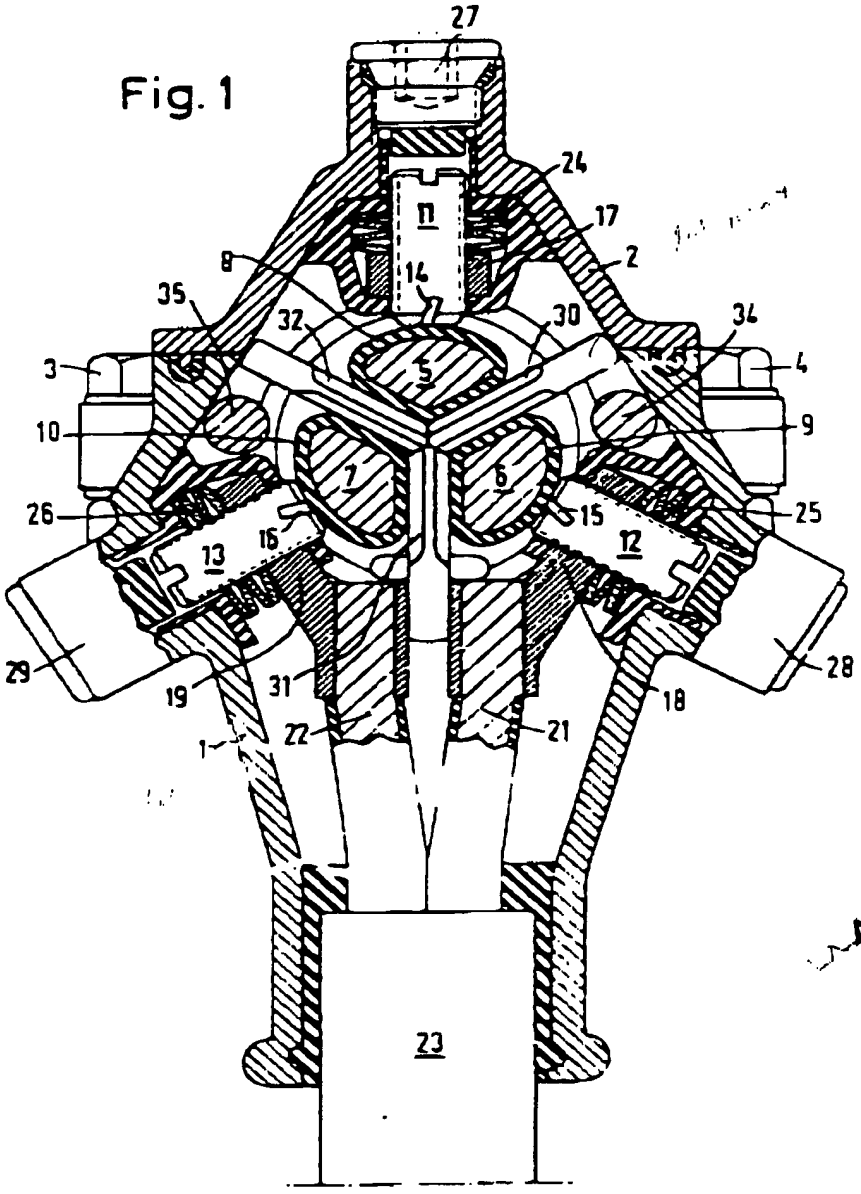
8 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig. 1



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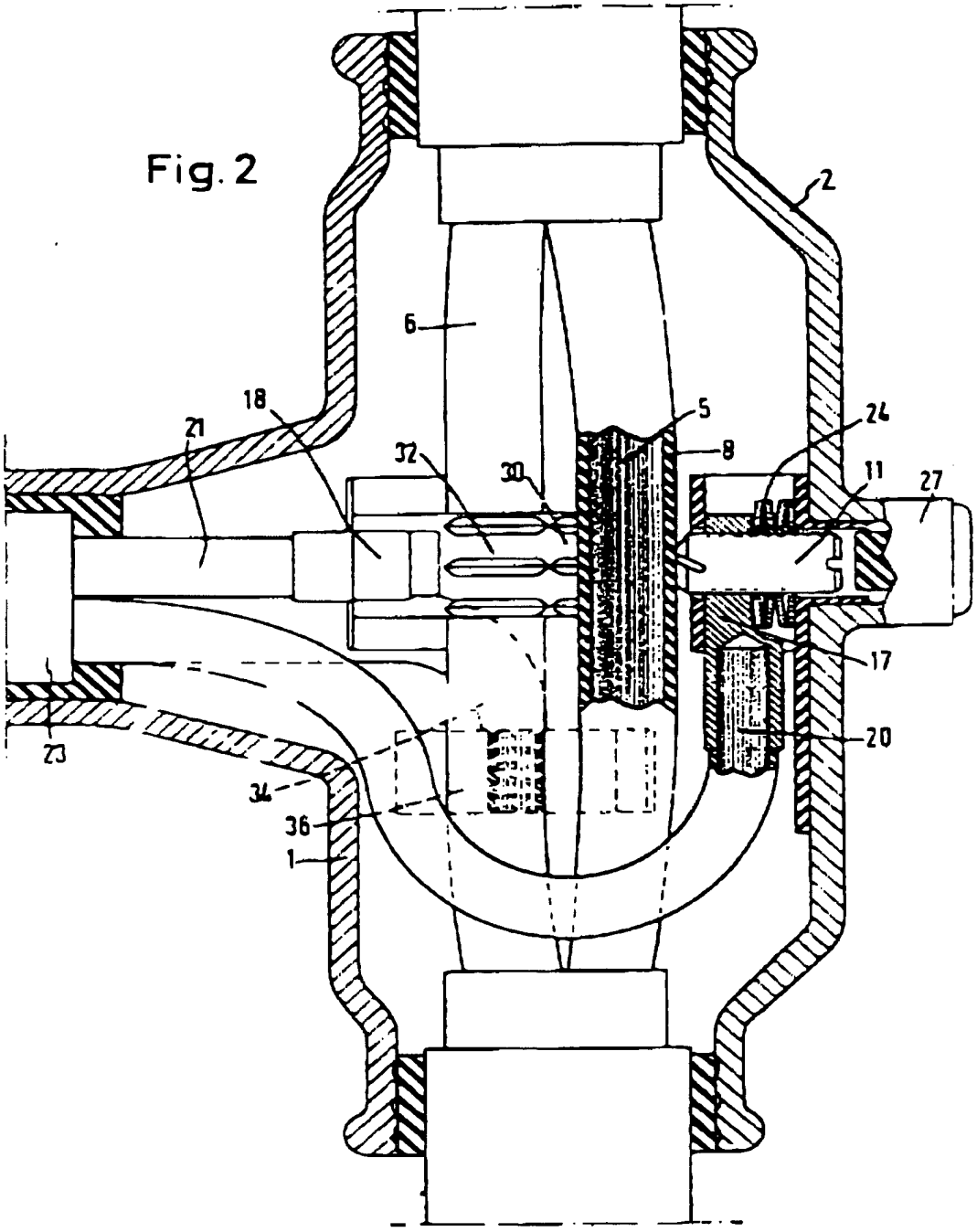
Sheet 2

Fig. 2



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Sheet 3

Fig.3

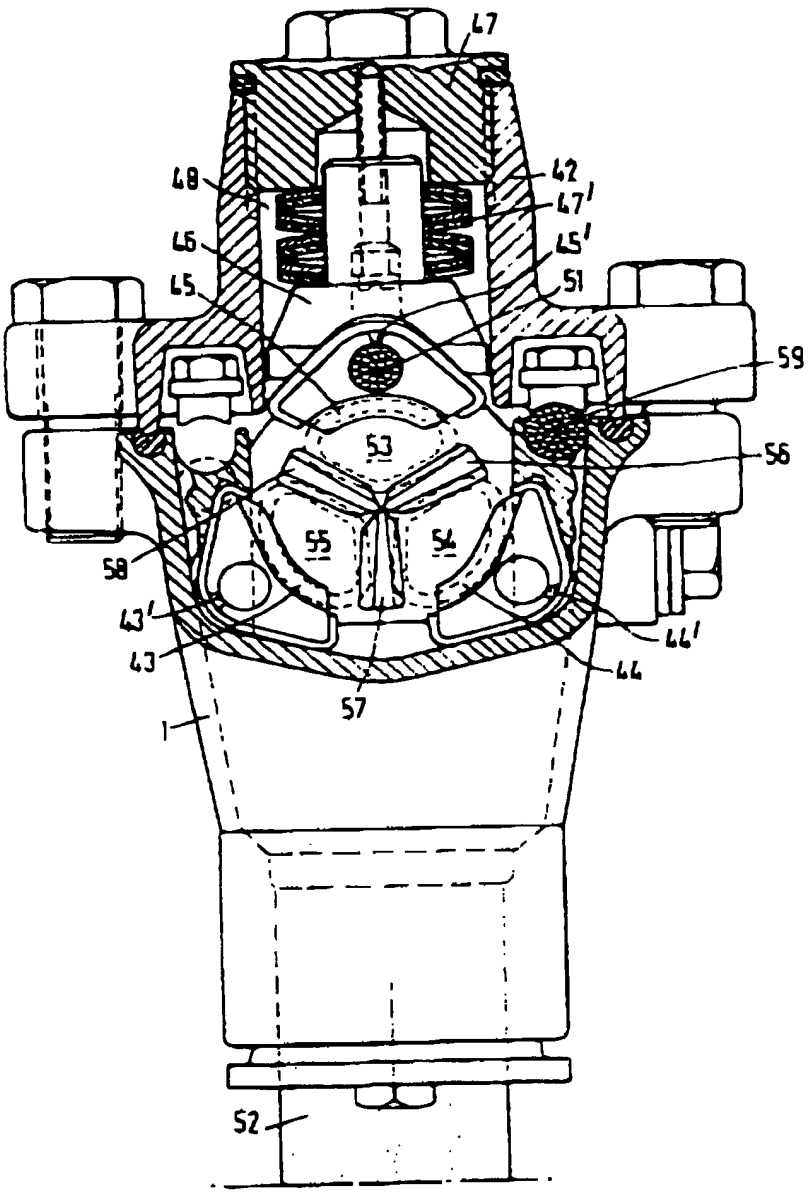

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Fig.4

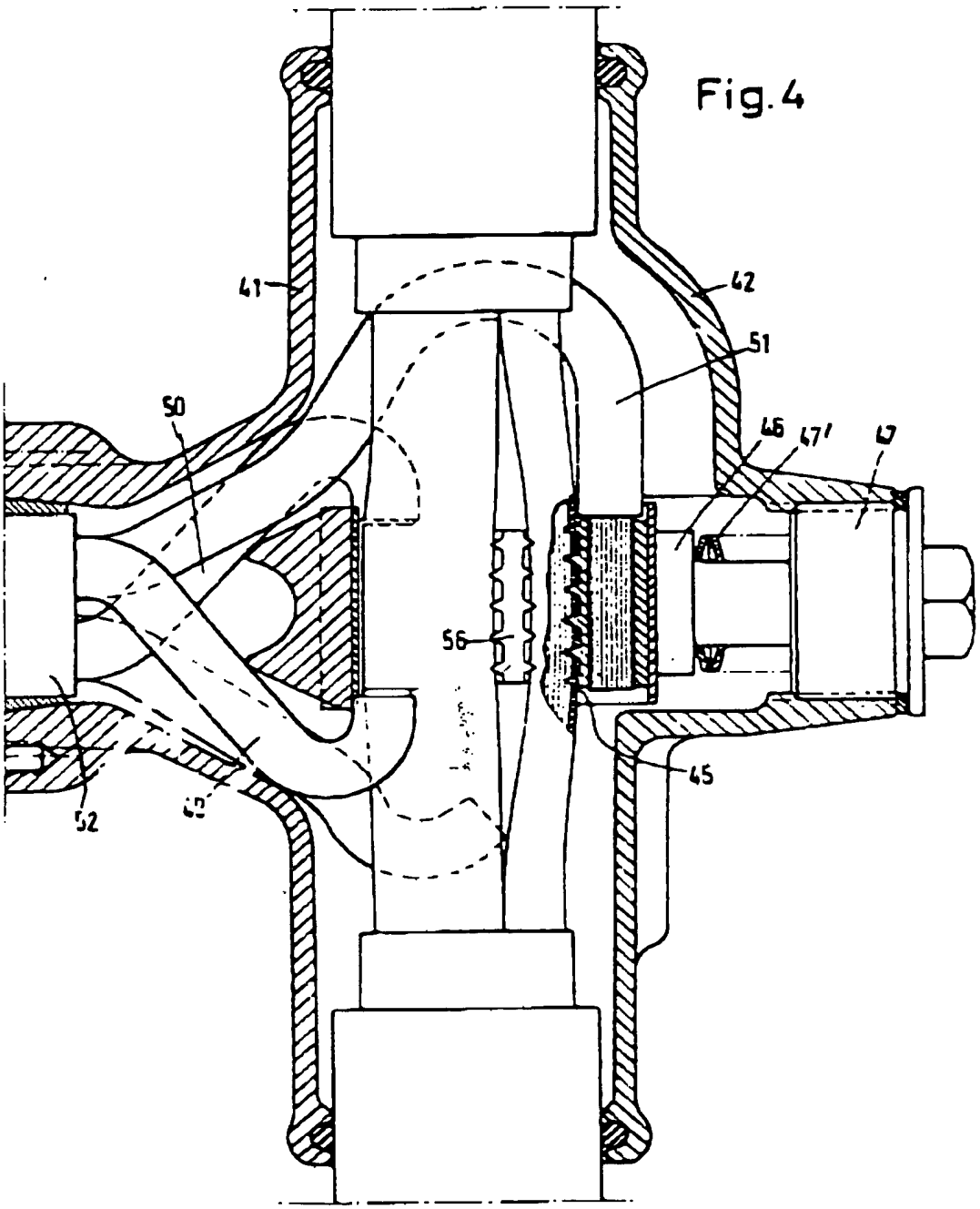

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Fig. 5

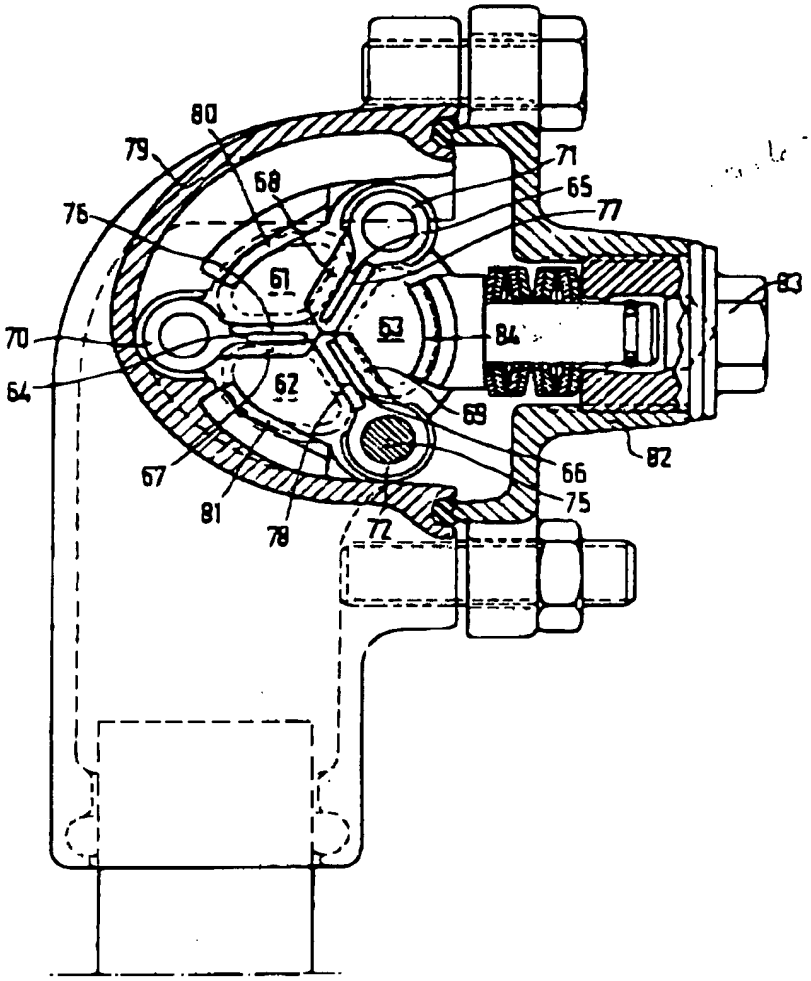

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Fig.6

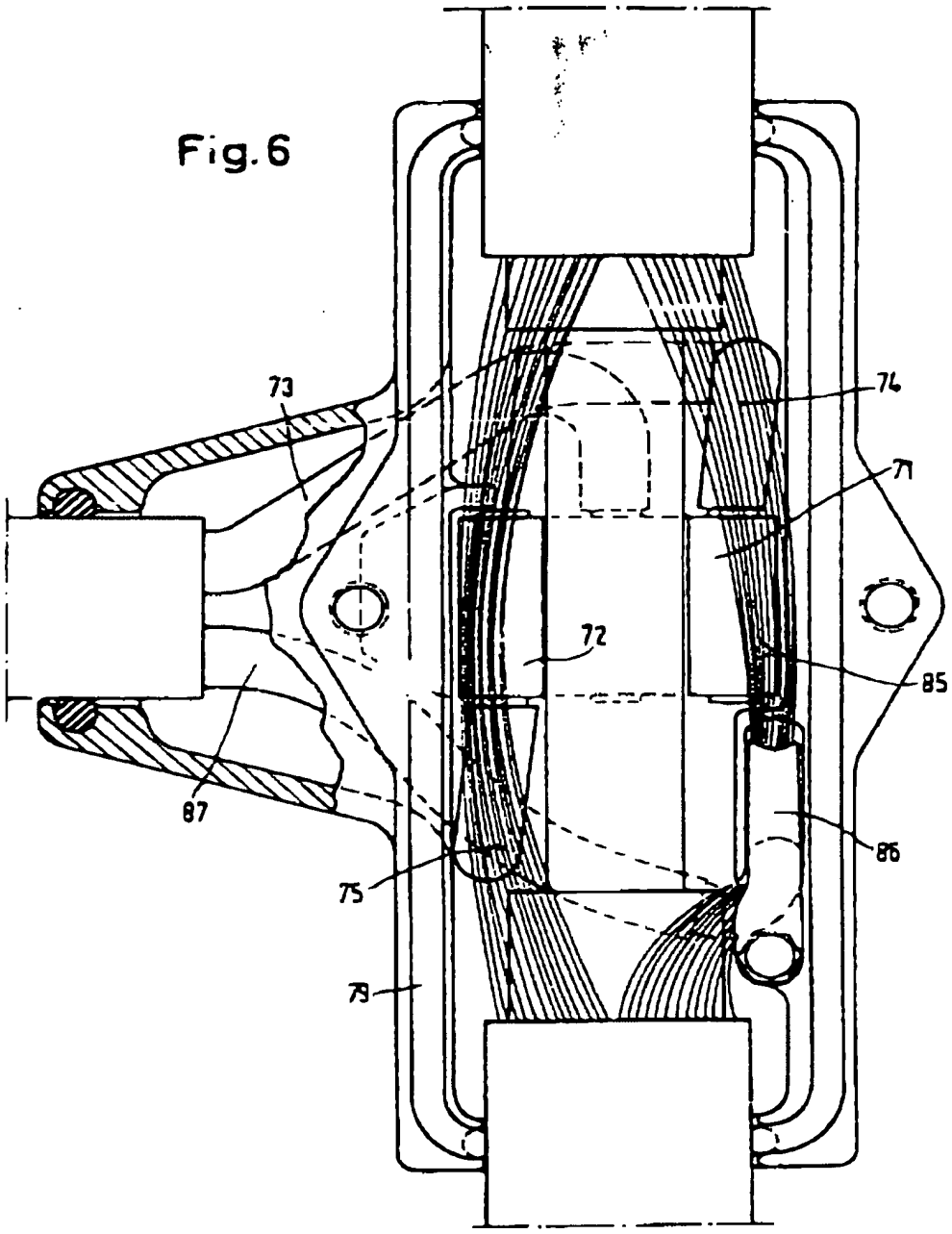

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Fig.7

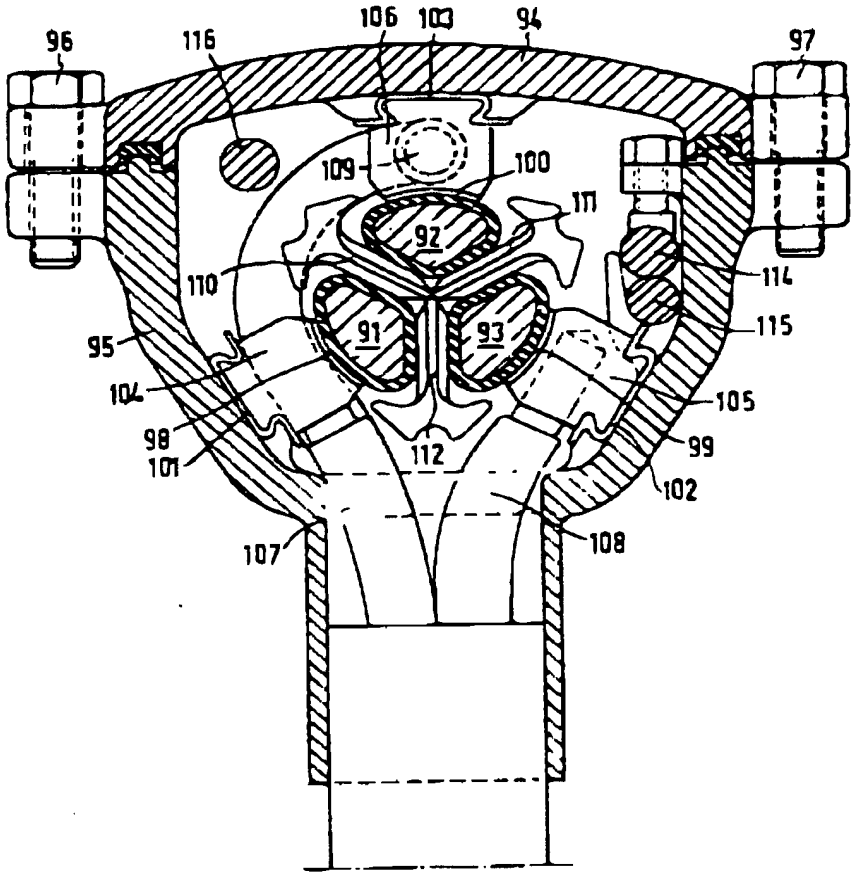

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Fig.8